

REMARKS

Entry of the foregoing and reconsideration of the application identified in caption, as amended, pursuant to and consistent with 37 C.F.R. §1.114 and in light of the remarks which follow, are respectfully requested.

By the above amendments, new claims 38 and 39 have been added which depend from claim 1. Support for such new claims can be found in the instant specification at least at page 3, lines 5-6, and page 31, lines 18-29, respectively. Entry of the foregoing amendments is proper in view of the fact that a Request for Continued Examination is being concurrently filed herewith. See 37 C.F.R. §1.114.

In the Official Action, claims 1-3, 9-24 and 27-37 stand rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent Application Publication No. 2004/0151450 (*Wadsworth et al*) in view of U.S. Patent Application Publication No. 2001/0026667 (*Kawanishi et al*). Claims 4-8 stand rejected under 35 U.S.C. §103(a) as being obvious over *Wadsworth et al* in view of *Kawanishi et al*, and further in view of U.S. Patent No. 7,106,933 (*Han*). Claims 25 and 26 stand rejected under 35 U.S.C. §103(a) as being obvious over *Wadsworth et al* in view of *Kawanishi et al*, and further in view of U.S. Patent No. 6,954,574 (*Russell et al*).¹ Withdrawal of these rejections is respectfully requested for at least the following reasons.

In response to Applicants' comments concerning the non-obviousness of combining *Wadsworth et al* with *Kawanishi et al*, the Patent Office has taken the position that *Wadsworth et al* teaches such modification of the applied art at paragraph

¹ The patent number of *Russell et al* cited at page 8 of the Official Action contains a typographical error. The correct patent number has been provided in the form PTO-892 citing such document.

[0025] thereof. See Official Action at page 11. Such disclosure of *Wadsworth et al* is reproduced below:

The refractive-index profile may result in additional changes in the optical properties of the material; for example, it may define an optically dispersive material.

By such disclosure, *Wadsworth et al* teaches that the refractive-index profile may have an effect on the optical properties of the material. **There is no teaching or suggestion of modifying the refractive index of the core such that it is lower than the material surrounding the core.** In fact, such disclosure does not even pertain to modifying the refractive-index profile at all. Rather, such disclosure relates to the effect the refractive-index profile has upon the optical properties of the material.

The Examiner is respectfully requested to reconsider the Patent Office's position taken concerning the combinability of *Wadsworth et al* with *Kawanishi et al*. Applicants submit that upon a fair and reasonable reading of *Wadsworth et al*, it is apparent that the proposed modification of the applied art would not have been obvious to the ordinarily skilled artisan.

As previously noted, it is well established that "If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious." M.P.E.P. §2143.01(VI). In the present case, the fiber shown in Figure 7 of *Wadsworth et al* is specifically designed to provide an effective refractive index of the core which decreases radially outwards from a maximum in the central core region 430 through a local minimum in the surrounding region 440. See paragraph [0085]. The fiber's principle of operation is based on such radially outward decreasing refractive index, and the high refractive index of the core is

critical to achieving *Wadsworth et al*'s desired structure in which the refractive index decreases in a radially outward direction. Clearly, for this reason, it would not have been obvious to one of ordinary skill in the art to modify *Wadsworth et al* by employing the low refractive index core of *Kawanishi et al*.

Furthermore, the alleged combination of *Wadsworth et al* and *Kawanishi et al* fails to disclose or suggest a boundary region having either (1) at most two-fold rotational symmetry or (2) a rotational symmetry that reduces the rotational symmetry of the waveguide to at most two-fold rotational symmetry, the symmetry of the boundary region resulting at least in part from azimuthal variations therein, which are substantially uncharacteristic of the cladding region, as recited in claim 1. Concerning (1), as disclosed in paragraph [0085] of *Wadsworth et al* and in view of FIG. 7, regions 430 and 440, and the region therebetween, are hexagonally shaped. The Examiner has taken the position that "the two fold rotational symmetry is visible in Fig. 7 and Paragraph [0026]." Official Action at page 3. However, regions 430 and 440, and the region therebetween, are hexagonally shaped and have a six-fold symmetry, not at most a two-fold symmetry. With regard to (2), the region between regions 430 and 440 is of the same material as the cladding 470, i.e., bulk silica. As such, the region between regions 430 and 440 of the *Wadsworth et al* fiber do not exhibit azimuthal variations that are uncharacteristic of the cladding region; to the contrary, such region is formed from the same material as the cladding.

Concerning such claimed subject matter, the Examiner has taken the position that *Wadsworth et al* discloses at paragraph [0026] that the fiber has two-fold symmetry. See Official Action at page 11. Even if such disclosure refers to a material which may have two-fold rotational symmetry, however, the Patent Office has relied on

the waveguide shown in Figure 7 of *Wadsworth et al* in the present rejection. As discussed above, in such waveguide, regions 430 and 440, and the region therebetween, are hexagonally shaped and have a six-fold symmetry, not at most a two-fold symmetry.

The other secondary applied documents (i.e., *Han* and *Russell et al*) fail to cure the above-described deficiencies of *Wadsworth et al*. In this regard, the Patent Office has relied on *Han* for disclosing boundary nodes having specific characteristics. See Official Action at pages 7-8. *Russell et al* has been relied on for disclosing that any beat length can be introduced into a fiber. See Official Action at pages 8-9. However, even if such secondary applied documents would have been combined with *Wadsworth et al* in the manner suggested, the resulting combination nevertheless fails to disclose or suggest a relatively high refractive index boundary region that surrounds the core region, as recited in claim 1. Further, the alleged combination does not disclose or suggest a boundary region having either (1) at most two-fold rotational symmetry or (2) a rotational symmetry that reduces the rotational symmetry of the waveguide to at most two-fold rotational symmetry, the symmetry of the boundary region resulting at least in part from azimuthal variations therein, which are substantially uncharacteristic of the cladding region.

For at least the above reasons, it is apparent that independent claim 1 is non-obvious over *Wadsworth et al*, *Kawanishi et al*, *Han* and *Russell et al*, in the manner applied by the Patent Office.

Independent claim 31 is directed to a method of forming a photonic crystal fibre, and recites forming a preform comprising an elongate, relatively low refractive index core region; and forming, at the interface between the core region and the cladding

region, a boundary region, comprising one or more relatively high refractive index regions. For at least the reasons discussed above, the applied documents fail to disclose or suggest forming, at the interface between the core region and the cladding region, a boundary region, comprising one or more relatively high refractive index regions, as recited in claim 31.

Independent claim 34 is directed to a method of forming a photonic crystal fibre, and recites arranging a plurality of elongate members, at least some of which are capillaries, into a pre-form stack comprising an elongate cladding region enclosing an elongate core region, the members in the cladding region forming a characteristic pattern, apart from at least one member in a boundary region, at or near to the core region, which breaks the characteristic pattern and renders the boundary region, in the transverse cross-section, no more than two-fold rotationally symmetric about any axis. In view of the discussion above, it is apparent that the alleged combination of applied documents does not disclose or suggest a boundary region which breaks the characteristic pattern and renders the boundary region, in the transverse cross-section, no more than two-fold rotationally symmetric about any axis. By comparison, regions 430 and 440 of the *Wadsworth et al* fiber, and the region therebetween, are hexagonally shaped and have a six-fold symmetry.

For at least the above reasons, it is apparent that the applied documents do not disclose or suggest each feature recited in independent claims 1, 31 and 34. Accordingly, withdrawal of the above §103(a) rejections is respectfully requested.

From the foregoing, further and favorable action in the form of a Notice of Allowance is believed to be next in order, and such action is earnestly solicited.

If there are any questions concerning this paper or the application in general, the Examiner is invited to telephone the undersigned.

Respectfully submitted,

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